



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/540,132	06/21/2005	Richard E Duren	2003US002	5375

34477 7590 08/01/2007
EXXONMOBIL UPSTREAM RESEARCH COMPANY
P.O. BOX 2189
(CORP-URC-SW 337)
HOUSTON, TX 77252-2189

EXAMINER

PHILLIPS, FORREST M

ART UNIT	PAPER NUMBER
----------	--------------

2837

MAIL DATE	DELIVERY MODE
-----------	---------------

08/01/2007

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/540,132

Applicant(s)

DUREN ET AL.

Examiner

Forrest M. Phillips

Art Unit

2837

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 10 May 2007.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-28 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-28 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____

DETAILED ACTION

Claim Objections

Claims 1 and 11 are objected to because of the following informalities: The use of both "polarity" and "phase" in the claim creates some confusion as to the claimed subject matter, Examiner suggests the use of only phase, such as "generating up-going and down-going waves which are 180 degrees out of phase". Appropriate correction is required.

With respect to claim 14 Examiner considers it a typographical error to be dependent upon claim 11 and has treated as though depending from claim 13.

1. "Blow out" embodiment.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 6 and 26-27 are rejected under 35 U.S.C. 102(b) as being anticipated by Ray (US RE32683).

With respect to claim 6 Ray discloses a marine seismic source method, the method comprising: generating up-going and down-going waves through a seismic source device wherein at least part of the device is below the surface of the water and the device creates an up-going wave and a first down-going wave, wherein the up-going wave is created substantially near the surface of the water and has enough energy to

Art Unit: 2837

break through the surface of the water into the atmosphere, thereby there is no significant wave reflected off the surface of the water and the first down-going wave is the only significant wave produces by the source (Column 7 lines 1-50).

With respect to claim 26 Examiner considers that Ray also discloses the apparatus (see figures and Column 7 lines 1-50).

With respect to claim 27 Ray further discloses wherein the source device is an airgun located near the surface of the water and the collapsing are pocket is blown out of the water(Column 5 lines 60-68).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 8 and 28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ray in view of Ambs (US6230840).

With respect to claims 8 and 28 Ray discloses the invention as claimed except wherein the first down going wave contains frequencies of less than 10 Hz.

Ambs discloses that this frequency range is typical of airguns (Column 1 lines 30-31).

At the time of the invention it would have been obvious to one of ordinary skill in the art that the range as claimed would be inherently present in the in gun of Ray as explicitly stated by Ambs.

Claims 7 and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ray in view of He

With respect to claims 7 and 9 Ray discloses the invention as claimed except for further comprising detecting the seismic waves produced from the seismic source with at least one motion sensor or with both motion sensors and pressure sensors and specifically wherein the motion sensors are selected from the group consisting of displacement, velocity, acceleration, higher derivatives or particle displacement, Doppler shift, pressure gradients, and any combination thereof.

He discloses the use of motion sensors and also pressure sensors (Column 5 lines 20-40) it would have been obvious to one of ordinary skill in the art to combine the teachings of He to detect the waves generated by the source of Ray. One of ordinary skill in the art would understand the need to record the data generated by the source of Ray.

Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ray in view of He as applied to claim 7 above, and further in view of Galbraith and Millington.

Ray as modified discloses the invention as claimed except wherein an inversion is applied to the recorded seismic data to reduce wavelet uncertainty.

Galbraith and Millington disclose the use of inversion of seismographic data.

At the time of the invention it would have been obvious to one of ordinary skill in the art to combine the teachings of Galbraith and Millington to apply an inversion to the data gathered in the method of Ray as modified to recover low frequency data.

2. Reflected wave embodiment.

Claim Rejections - 35 USC § 103

Claims 1, 11 and 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mifsud (US4578784) in view of Brown (US3384868).

With respect to claim 1 Mifsud discloses a marine seismic source method, the method comprising: generating waves with opposite polarity (Column 5 lines 35-50).

Brown discloses that it is known to have vibrator sources which create an up-going and a down-going wave (refer to structure with reference to up and down given in specification).

At the time of the invention it would have been obvious to one of ordinary skill in the art to combine the teachings of Brown to have the source oriented in a vertical rather than horizontal configuration and as such create waves which are going up and down with respect to one another rather than left and right.

As is known in the art when a wave produced from a typical isotropic source, behaving like a monopole strikes the surface of the ocean it reflects back 180 degrees out of phase with the original up-going wave and combining with the down going wave cancels the original down going wave. As the source of Mifsud as modified creates a

Art Unit: 2837

wave which is originally 180 degrees out of phase the reflected wave will have the same polarity as the original down going wave and as such not combine destructively.

With respect to claim 11 Examiner considers the structure to be present given the method of claim 1 (see figures and Column 5 lines 35-50).

With respect to claim 24 Mifsud as modified further discloses wherein the device is a rigid plate (12) which serves as a reaction mass and backplane below the surface of the water and the means for causing oscillations in the water is at least one piston and at least one corresponding cylinder through the plate and oriented normal to the large surfaces of the plate, the piston pushing directly on the water, the piston adapted to oscillate along the axis of the cylinder when activated and means for activating the piston wherein at least one piston is pushed down a compression wave is radiated as a down going wave and rarefaction wave is radiated as an up-going wave, wherein the compression waves is the first down-going wave and the rarefaction wave is the up-going wave (refer to figure 1).

Claims 2 and 4 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mifsud in view of Brown as applied to claim 1 above, and further in view of He (US6607050).

With respect to claims 2 and 4 Mifsud as modified discloses the invention as claimed except further comprising detecting the seismic waves produced from the source with at least one motion sensor or with both motion sensors and pressure sensors, the motion sensors specifically selected from the group consisting of velocity,

Art Unit: 2837

acceleration, higher derivatives of particle motion, Doppler shift, pressure gradient and any combination thereof.

He discloses the sensing of the seismic waves generated and the sensors selected from the group listed (Column 5 lines 20-40).

At the time of the invention it would have been obvious to one of ordinary skill in the art to combine the teachings of He to detect the waves generated with the method of Mifsud to gain a greater understanding of the substrate characteristics.

Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Mifsud in view of Brown and He as applied to claim 2 above, and further in view of Galbraith and Millington.

With respect to claim 5 Mifsud as modified discloses the invention as claimed except further comprising an inversion applied to the recorded seismic data to reduce wavelet uncertainty.

Galbraith and Millington disclose the use of inversion of seismographic data.

At the time of the invention it would have been obvious to one of ordinary skill in the art to combine the teachings of Galbraith and Millington to apply an inversion to the data gathered in the method of Mifsud as modified to recover the low frequency data.

Claims 3,12,15, 21-23, and 25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mifsud in view of Brown as applied to claims 1, 11 and 24 above, and further in view of Ambrose (US6230840).

With respect to claims 3 12,15, and 25 Mifsud as modified discloses the invention as claimed except wherein the generated waves contain frequencies of less than 10 Hz.

Ambs discloses an apparatus and method of producing waves containing frequencies less than 10 Hz (Column 2 lines 1-15).

At the time of the invention it would have been obvious to one of ordinary skill in the art to combine the teachings of Ambs to incorporate the frequencies less than 10 Hz with the method of Mifsud as modified to provide the important low frequency data.

With respect to claim 21 Ambs further discloses wherein the device is at least two marine vibrators (12 in figure 1C) comprising at least one upper marine vibrator that vibrates out of phase with at least one lower marine vibrator wherein the upper marine vibrator radiates an up-going waves that has reverse polarity of the first down-going wave that radiates from the lower marine vibrator and the backsides of the vibrators are stationary during operation of the vibrators.

With respect to claim 22 Ambs further discloses wherein the waves contain frequencies of less than 10 Hz (Column 2 lines 1-15).

With respect to claim 23 Ambs further discloses wherein the backsides of the upper and lower vibrators are connected (figure 1c).

Claims13-14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mifsud in view of Brown as applied to claim11 above, and further in view of Airhart (US49916885).

With respect to claim 13 Mifsud as modified discloses the invention as claimed except wherein the device is a vibrating baseplate below the surface of the water and the means for causing oscillations in the water is a reaction mass above the oceans surface, the reaction mass housing a piston and a corresponding cylinder, the piston rigidly attached to the baseplate, the piston adapted to oscillate along the axis of the cylinder when activated and means for activating the piston wherein as the vibrating baseplate is pushed down a compression wave is radiated as a down going wave and a rarefaction wave is radiated as an up-going wave, wherein the compression wave is the first down going wave and the rarefaction wave is the up-going wave.

Airhart discloses a vibrating baseplate (76 in figure 2) below the surface is the water and a means for causing oscillations is a reaction mass (30 in figure 2) the reaction mass housing a piston (40 in figure 2) and a corresponding cylinder (38), the piston adapted to oscillate along the axis of the cylinder when activated and means for activating the piston (60) wherein the vibrating baseplate is pushed down a compression wave is radiated as a down going wave and a rarefaction wave is radiated as an up-going wave, wherein the compression waves is a first down gogin wave and the rarefaction wave is the first up-going wave.

At the time of the invention it would have been obvious to one of ordinary skill in the art to combine the teachings of Airhart to use a reaction mass and piston cylinder arrangement for the apparatus of Mifsud as modified to provide an effective means of creating low frequencies.

Mifsud as modified discloses the invention as claimed except wherein the piston is rigidly attached to the baseplate. It would have been obvious to one of ordinary skill in the art to attach the piston to the baseplate as it has been held that rearranging the parts of an invention involves only routine skill in the art. In re Japikse, 86 USPQ 70.

With respect to claim 14 Airhart further discloses wherein the means for activating the piston is a hydraulic system with fluid pressure from valves connected to the cylinder (column 3 lines 30-40)

Claims 16-17 and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mifsud in view of Brown as applied to claim 11 above, and further in view of Myers (US4853905).

With respect to claim 16 Mifsud as modified discloses the invention as claimed except wherein the device is a flexible membrane below the surface of the water and the means for causing oscillations in the water is a supporting frame connected to the membrane, the supporting frame containing at least one drive mechanism adapted to oscillate the membrane thereby generating an up-going wave from the membrane that has reverse polarity to the first down going wave generated from the membrane.

Myers discloses an upper (12, 14 in figure 1) and lower (12, 16 in figure 1) membrane for creating acoustic waves (abstract) and a driving mechanism (20 in figure 1).

At the time of the invention it would have been obvious to one of ordinary skill in the art to combine the teachings of Myers to use two membranes to generate the output of

Art Unit: 2837

phase waves taught by Mifsud to provide a structure that would generate up-going and down-going waves simply and effectively.

With respect to claim 17 Myers discloses the use of a hydraulic system (20 is a hydraulic cylinder).

Claim 18 is rejected under 35 U.S.C. 103(a) as being unpatentable over Mifsud in view of Brown and Myers as applied to claim 16 above, and further in view of Ambs.

Mifsud as modified discloses the invention as claimed except wherein the generated waves contain frequencies of less than 10 Hz.

Ambs discloses an apparatus and method of producing waves containing frequencies less than 10 Hz (Column 2 lines 1-15).

At the time of the invention it would have been obvious to one of ordinary skill in the art to combine the teachings of Ambs to incorporate the frequencies less than 10 Hz with the method of Mifsud as modified to provide the important low frequency data.

Claim 19 is rejected under 35 U.S.C. 103(a) as being unpatentable over Mifsud in view of Brown as applied to claim 11 above, and further in view of Yang (US4153134) and Myers.

With respect to claim 19 Mifsud as modified discloses the invention as claimed except wherein the device is at least two flexible membranes and the means for creating the oscillations is a rigid frame that permits airflow from one of the membranes to the other and the membranes are adapted to expand when air enters a membrane and contract when air leaves the membrane.

Yang discloses the use of an air filled membrane and a rigid frame (12) to create seismic waves.

Myers discloses the use of the two membrane system (see above rejection and citation of Myers).

At the time of the invention it would have been obvious to one of ordinary skill in the art to combine the teachings of Myers to use two membranes with the teachings of Yang to use an air filled membrane to cause seismic waves and oscillations with the method and device of Mifsud as modified to provide a structure which efficiently provided up-going and down-going waves without the need for Hydraulic fluid.

Claim 20 is rejected under 35 U.S.C. 103(a) as being unpatentable over Mifsud in view of Brown, Yang and Myers as applied to claim 19 above, and further in view of Ambros.

Mifsud as modified discloses the invention as claimed except wherein the generated waves contain frequencies of less than 10 Hz.

Ambros discloses an apparatus and method of producing waves containing frequencies less than 10 Hz (Column 2 lines 1-15).

Art Unit: 2837

At the time of the invention it would have been obvious to one of ordinary skill in the art to combine the teachings of Ambs to incorporate the frequencies less than 10 Hz with the method of Mifsud as modified to provide the important low frequency data.

Response to Arguments

Applicant's arguments with respect to claims 1-28 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

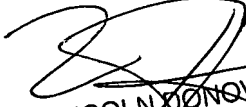
Any inquiry concerning this communication or earlier communications from the examiner should be directed to Forrest M. Phillips whose telephone number is 5712729020. The examiner can normally be reached on Monday through Friday 8:30-5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Lincoln Donovan can be reached on 5712721988. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Art Unit: 2837

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

FP


LINCOLN DONOVAN
SUPERVISORY PATENT EXAMINER